Lecture 3

The Technological Foundation of E-Commerce

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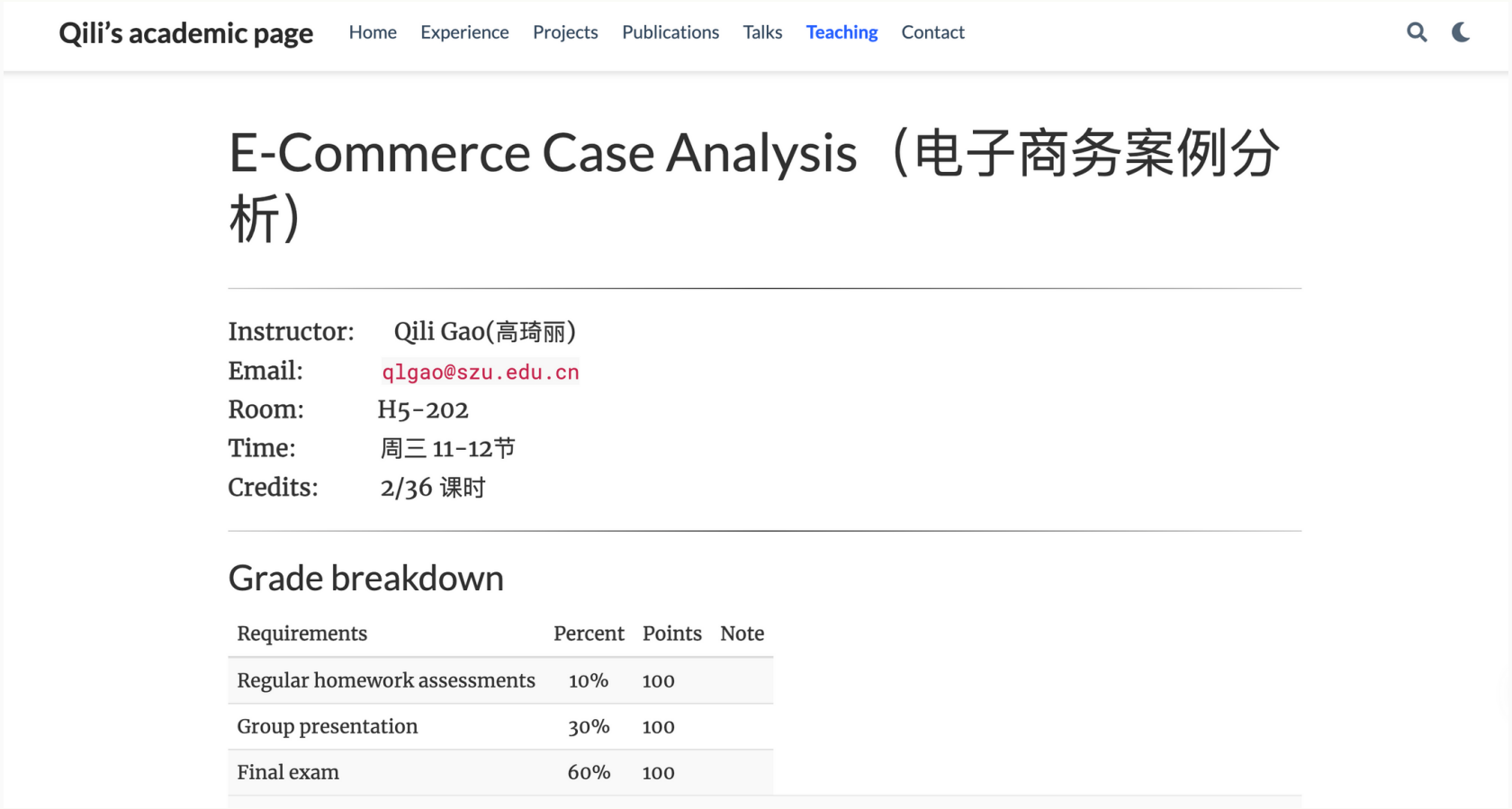
Course slides

https://www.gaoqili.cn/teach/e-commerce2023/



Learning objects

1. Understand the fundamentals of the Internet.
2. Gain knowledge about client-side and server-side technologies.

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Section 1

Internet

E-commerce and Internet

E-commerce is an economic activity conducted based on computer software, hardware, and network communication technologies. It uses the Internet, intranets, and extranets as its platforms, enabling businesses to efficiently carry out their internal operational activities and engage in commercial trade with other enterprises, establish partnerships, ultimately reducing production, supply, and distribution costs while increasing business profits and exploring new markets.

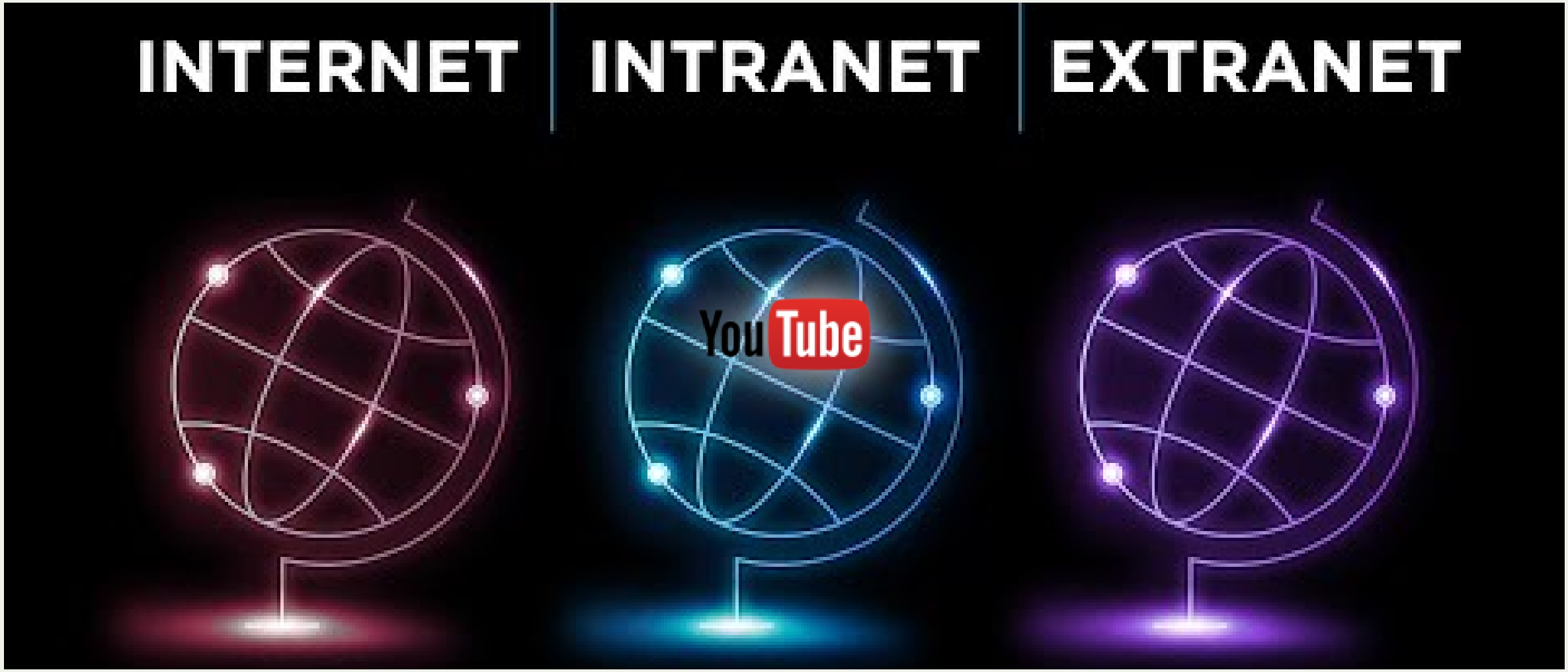
In short, E-commerce is based on Internet technology for the transmission, processing, and exchange of business information.

The definition of the Internet

What is the Internet

- The Internet refers to a global network of interconnected computers and devices that use standardized communication protocols to exchange data and information. It is a vast infrastructure that enables communication, collaboration, and the sharing of resources across geographical boundaries.
- 互联网是将处于不同地理位置并且有独立计算能力的计算机系统，利用传输介质和通信设备相互连接在一起，在网络操作系统和网络通信软件的控制下，使用标准化的通讯协议，实现资源共享的计算机集合。

Internet, Intranet, Extranet



The brief history of the Internet

1969

A decentralized network called ARPANET by the U.S.

高级研究计划局网络（Advanced Research Projects Agency Network），通称**阿帕网**（ARPANET）是美国国防高级研究计划局开发的世界上第一个运营的数据包交换网络，是全球互联网的鼻祖。

1970s

The development of TCP/IP

Email

1980s

NSFnet (**The National Science Foundation Network**) replaced ARPANET as the backbone of the Internet, marking the birth of the world's first interconnected network.

1990s

1989：World Wide Web (WWW)

Search engine

2000s

Personal computers, and mobile devices

1999: Alibaba, Tecent QQ

3G, 4G, 5G....

Now and Future

Internet of Things (IoT), artificial intelligence (AI), and blockchain

.....

...

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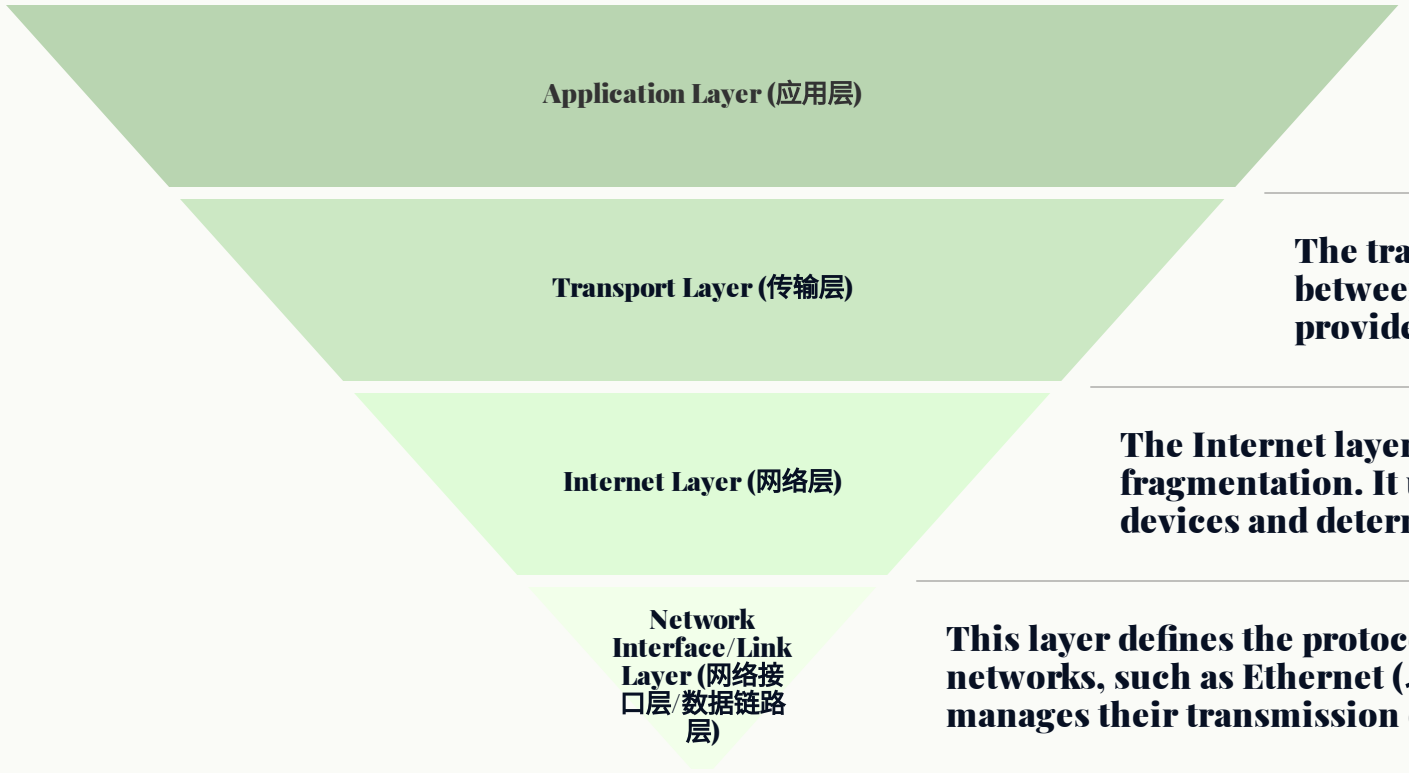
Q+A

Are the Internet and WWW the same?

What is 5G?

Internet Protocol-TCP/IP

TCP/IP (Transmission Control Protocol/Internet Protocol, 传输控制协议/网络协议) is a suite of communication protocols that form the basis of the Internet. It is a set of rules and standards that govern how data is transmitted, routed, and received across networks.



This layer represents the protocols and services used by applications to communicate over the Internet. Examples include HTTP for web browsing, FTP for

The transport layer manages end-to-end communication between devices. TCP, the most common transport protocol, provides reliable and connection-oriented transmission.

The Internet layer handles IP addressing, packet routing, and fragmentation. It uses IP addresses to identify source and destination devices and determines the best path for packet delivery.

This layer defines the protocols and standards for transmitting data over physical networks, such as Ethernet (以太网) or Wi-Fi. It encapsulates packets into frames and manages their transmission over specific network media.

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Internet Protocol-HTTP

HTTP (Hyper Text Transfer Protocol, 超文本传输协议)

HTTP is a protocol that defines how information is exchanged and communicated on the web. It allows for the retrieval and transfer of hypertext documents, which can include text, images, videos, and other multimedia content. HTTP operates in a client-server model, where a client (such as a web browser) sends requests to a server, and the server responds with the requested content.

URL (Uniform Resource Locator, 统一资源定位符)

URL is a standardized format used to specify the location of a resource on the web. It serves as an address or identifier for web pages, files, images, videos, and other resources accessible through the Internet.

http://www.abc.com/china/index.htm

- Scheme: The scheme indicates the protocol to be used, such as "http://" for HTTP or "https://" for secure HTTP.
- Domain Name: The domain name represents the website or server hosting the resource, such as "abc.com". It can also include subdomains, such as "www.abc.com".
- Path: The path "china/index.htm" specifies the specific location or file on the server.

Internet Protocol-SMTP, POP3, IMAP

SMTP (Simple Mail Transfer Protocol, 简单电子邮件传输协议)

SMTP is a protocol used for sending email messages from a client (sender) to a mail server (outgoing server) for delivery. It handles the transmission of messages over the internet and ensures they are routed to the appropriate recipient's mail server. SMTP is responsible for the reliable and efficient delivery of email between mail servers.

POP (Post Office Protocol, 邮局协议)

POP3 is an email retrieval protocol that allows users to download their emails from a mail server to their local devices. When an email client (e.g., Outlook) is configured with POP3, it connects to the mail server, authenticates the user's credentials, and retrieves new email messages from the server.

IMAP (Internet Message Access Protocol, 互联网邮件访问协议)

IMAP is another email retrieval protocol, but it offers more advanced features compared to POP3. With IMAP, email messages are stored on the mail server, and the email client interacts with the server to manage and access the messages. IMAP allows users to view, search, and organize their email messages on multiple devices since the messages remain stored on the server.

Internet Protocol (IP) address

A unique numerical label is assigned to each device connected to a computer network that uses the Internet Protocol for communication. It serves as a unique identifier for devices (e.g., a computer, smartphone, or server), allowing them to send and receive data over the internet.

IPv4

IPv4 (Internet Protocol version 4) is the most widely used version. It consists of 32 bits and allows for approximately 4.3 billion unique addresses. However, due to the rapid growth of internet-connected devices, the availability of IPv4 addresses has become limited.

192.168.0.1

IPv6

IPv6 (Internet Protocol version 6) is the successor to IPv4. It uses 128 bits and provides a much larger address space, allowing for approximately unlimited unique addresses. IPv6 was developed to address the exhaustion of IPv4 addresses and to support the increasing number of devices connected to the internet.

2001:0db8:85a3:0000:0000:8a2e:0370:7334

Domain Name (Domain Name System: DNS)

A domain name is a unique, human-readable identifier that represents a specific website or online entity on the internet. It is used to easily locate and access websites without having to remember the numerical IP address associated with the website's server.

Domain Name Label: This is the specific name chosen by the website owner or organization. For example, in the domain name "example.com," "example" is the domain name label.

Top-Level Domain (TLD): The TLD is the extension at the end of the domain name, indicating the type or category of the website. Common TLDs include ".com," ".org," ".net," and country-specific TLDs like ".uk" for the United Kingdom or ".cn" for China.

	Domain name	Domain type
Domestic Top-Level Domain	com	Business organisations
	edu	Education organisations
	gov	Government
	int	International organisations
	net	Internet providers
	org	Non-profit organisations
	cn	Country-code top-level domain for China

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Application of the Internet

1. Information Browsing and retrieval
2. Information publishing
3. Sending and receiving emails
4. Real-time communication
5. FTP File Transfer Service
6. Video calls and online conferences
7. ……

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SECTION 2

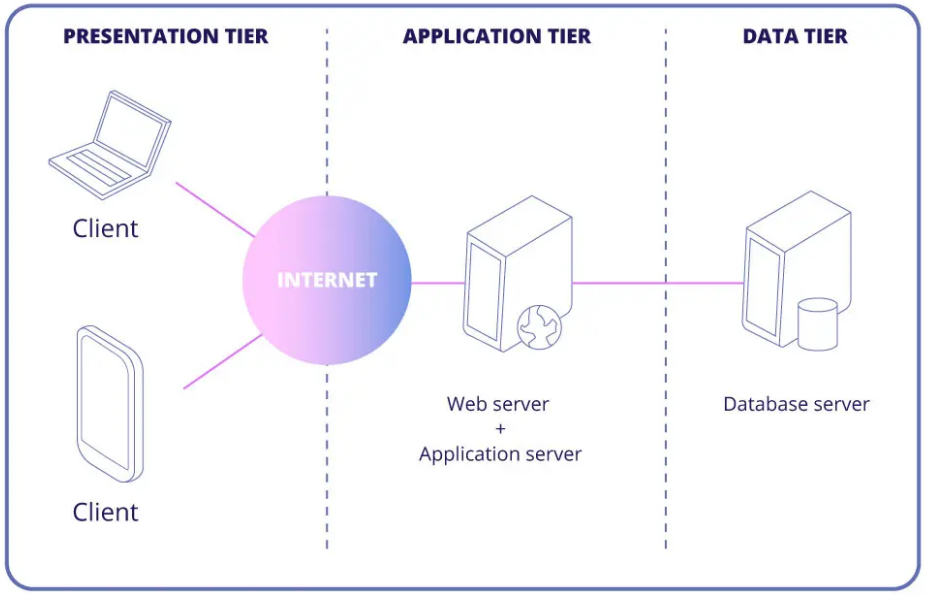
Web development technologies

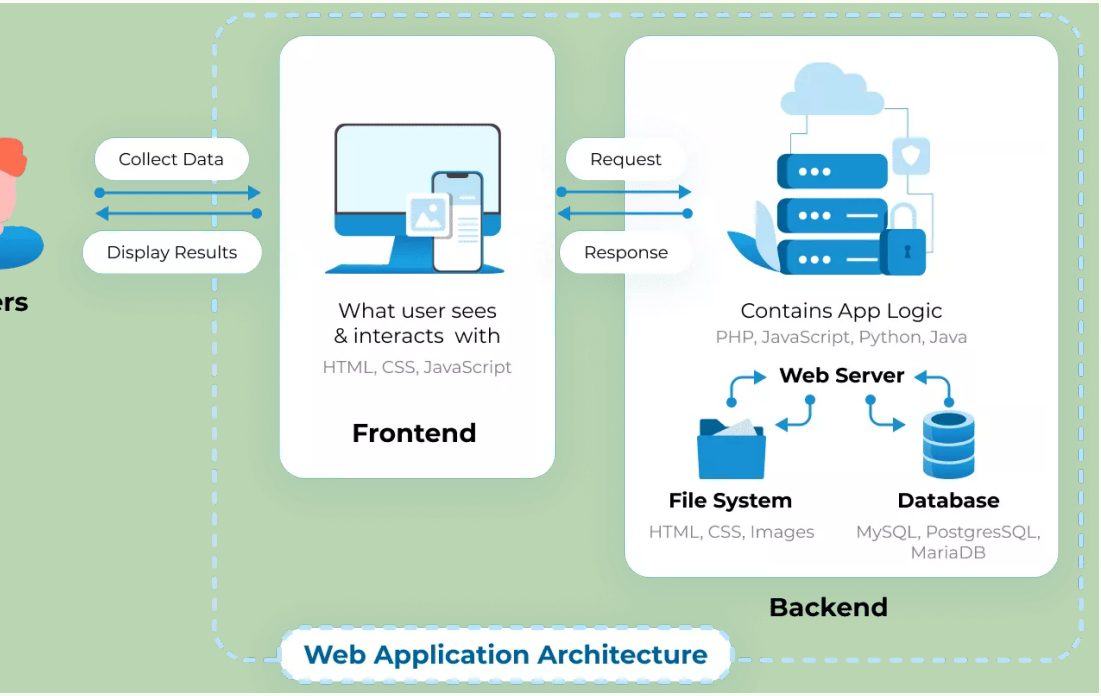
Web application architecture-B/S

B/S (Browser/Server)

Client side/Server side

Briefly, the web application architecture is a “skeleton” or layout that displays the interactions between application components, middleware systems, user interfaces, and databases. This kind of interaction allows a number of applications to work together simultaneously.





Web client technologies

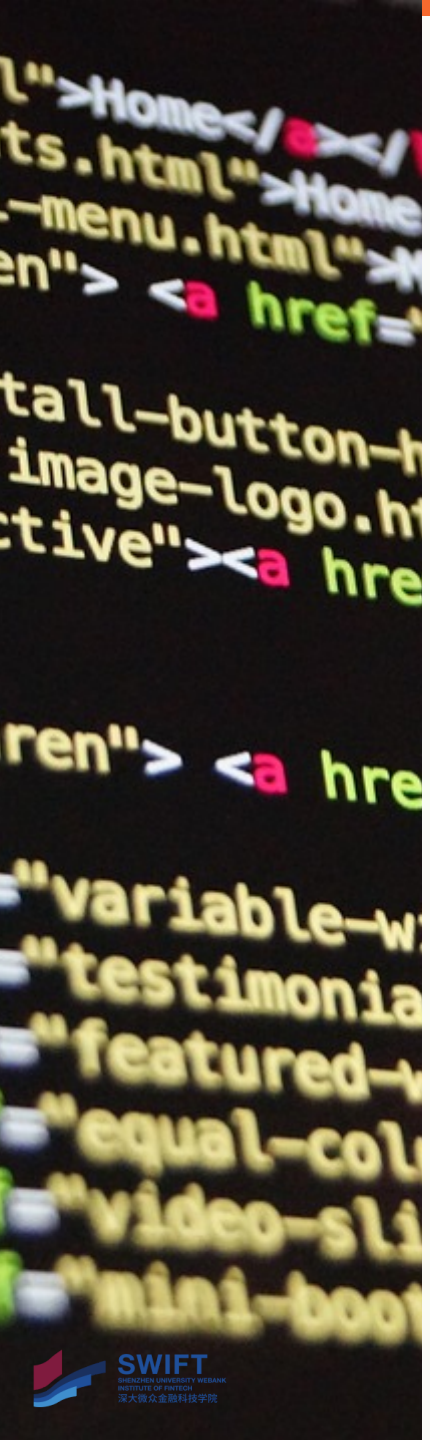
Web client technologies refer to the technologies used to create rich and interactive user interfaces and functionality within a web browser.

Web front-end engineer

A web front-end engineer, also known as a web front-end developer or web UI developer, is a professional responsible for designing and implementing the user interface (UI) and user experience (UX) of a website or web application. They focus on client-side development, utilizing various web technologies to create visually appealing, responsive, and interactive interfaces.

Responsibilities of Web front-end engineer

- Designing and developing user interfaces for websites and web applications.
- Implementing responsive designs that work well on different devices and screen sizes.
- Collaborating with designers and back-end developers to create seamless user experiences.
- Writing clean, modular, and maintainable front-end code using HTML, CSS, and JavaScript.
- Optimizing web applications for maximum speed and scalability.Ensuring cross-browser and cross-device compatibility.
- Conducting testing and debugging to identify and fix UI/UX issues.
- Staying updated with the latest web technologies and trends.



Web client technologies

HTML (超文本标记语言)

HTML (Hypertext Markup Language): A markup language used to create the structure and content of web pages.

CSS (层叠样式表)

CSS (Cascading Style Sheets): A style sheet language used to describe the presentation and layout of web pages.

JavaScript (脚本语言)

A scripting language used to implement interactivity and dynamic functionality on web pages.

XML (可扩展标记语言)

XML (Extensible Markup Language) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. It is widely used for storing and exchanging structured data between different systems.

HTML

https://www.geeksforgeeks.org/html/?ref=outind

CSS

https://www.geeksforgeeks.org/css/?ref=outind

Serve-side technologies

Server-side technologies refer to the tools and technologies used to build and manage server-side applications. These technologies are primarily used to handle client requests, execute business logic, interact with databases, and generate responses to be sent back to clients.

CGI (公共网关接口)

CGI (Common Gateway Interface) is a standard protocol that allows web servers to communicate with external programs or scripts to generate dynamic web content. It is a method for executing scripts or programs on a web server to process user requests and generate dynamic responses.

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ASP (Active Server Pages, 活动服务器页面)

ASP is a server-side technology and framework developed by Microsoft for creating dynamic web pages and web applications.

Functionality: ASP enables the creation of dynamic web pages by embedding server-side scripts within HTML code. These scripts can access and manipulate data, interact with databases, perform calculations, and generate dynamic content based on user inputs or other factors.

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JSP (Java Server Pages, Java 服务器页面)

JSP is a technology and framework that enables the creation of dynamic web pages using Java. It is a server-side technology that allows developers to embed Java code within HTML files to generate dynamic content.

Functionality: JSP allows developers to create dynamic web pages by embedding Java code within HTML templates. The Java code is executed on the server-side, and the resulting HTML is sent to the client's browser. This enables the generation of dynamic content based on user input, database queries, or other factors.

Serve-side technologies

Server-side technologies refer to the tools and technologies used to build and manage server-side applications. These technologies are primarily used to handle client requests, execute business logic, interact with databases, and generate responses to be sent back to clients.

PHP (Page Hypertext Preprocessor, 页面超文本处理器)

PHP is a widely-used server-side scripting language primarily designed for web development. It is open-source and has a large community of developers contributing to its growth and improvement.

Functionality: PHP is primarily used to develop dynamic web pages and web applications. It allows embedding PHP code directly within HTML files, enabling the generation of dynamic content, processing form data, interacting with databases, and performing various server-side tasks.

Database Integration: PHP has extensive support for interacting with databases, including MySQL, PostgreSQL, Oracle, and more. It provides database extensions and libraries that allow developers to connect to databases, execute queries, fetch results, and manage data effectively.

Database management technology

Database management technologies refer to various tools, systems, and approaches used to manage and organize data within databases.

- **Relational Database Management Systems (RDBMS):** RDBMS is a traditional and widely adopted database management technology. It organizes data into tables with predefined schemas, enforces data integrity through constraints, and supports complex querying using Structured Query Language (SQL).

- **NoSQL Databases:** NoSQL (Not Only SQL) databases are non-relational database management technologies that provide flexible and scalable data storage solutions. They are designed to handle large amounts of unstructured or semi-structured data and provide high-performance reads and writes.

- **NewSQL Databases:** NewSQL databases aim to combine the scalability and flexibility of NoSQL databases with the transactional consistency and querying capabilities of traditional RDBMS. They provide high-performance distributed database systems that can handle large-scale applications.

Database management technology

- **Cloud Databases:** Cloud databases are managed database services provided by cloud providers. They offer scalable, highly available, and fully managed database solutions without the need for infrastructure management. Cloud database technologies include Amazon RDS, Google Cloud Spanner, Microsoft Azure SQL Database, and MongoDB Atlas.
- **In-Memory Databases:** In-memory databases store data in the computer's memory instead of traditional disk storage. This approach provides faster data access and processing, making them suitable for applications with high-performance requirements.
- **Data Warehousing:** Data warehousing involves storing and managing large volumes of structured and historical data for analysis and reporting purposes. Data warehousing technologies enable organizations to integrate data from multiple sources, create data models, and perform complex analytical queries.